DEVRY INSTITUTE OF TECHNOLOGY
ELECTRONIC COMMUNICATIONS (WITH LABORATORY)
ECT261

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TEXT: Wheeler, Electronic Communications for Technicians (1st ed), Prentice-Hall

CREDIT HOURS: 4.0

UNIT   TOPIC
I.   FREQUENCY DOMAIN, AM THEORY
II.   AM TRANSMISSION AND RECEPTION
III.   FREQUENCY MODULATION TRANSMISSION AND RECEPTION
IV.   TRANSMISSION LINES AND ANTENNAS; LINK BUDGETS

This is a survey of electronic communications techniques, with an emphasis on analysis and troubleshooting at the system or block-diagram level. The primary emphasis is on AM and FM systems, with a technical overview of associated topics (propagation, transmission, and antennas) as time permits.

Earn your amateur radio license and get extra credit for ECT-261!

An amateur radio license is an excellent first step in electronic communications. Amateur radio is a fascinating hobby, and possession of a "ham" license is a strong demonstration of your commitment to the profession for potential employers. Morse code is no longer required for the Technician license.

Recommended Text: ARRL, Now You're Talking (Current ed.)
Text available through Radio Shack and Associated Radio (381-5900).

50 points of homework credit will be added for obtaining the Technician license. The license must be obtained during the term; to obtain credit, simply take the written test (offered several times each month in Kansas City), and show the instructor the CSCE given by the VE team.

If you already possess an amateur license, you may earn credit by upgrading, as follows: Tech Plus, 10 points; General, 25 points; Extra, 50 points. Point values are not cumulative; in other words, upgrading from General to Extra earns 50 points, not 75.

ATTENDANCE

Daily class attendance is required. *You are responsible for the material presented in all class sessions, regardless of your presence or absence.* Absence of more than 8 class sessions is cause for dismissal from the course, with a grade of F. You are expected to be on time for every class meeting. If you will not be able to make it to class on time, please call the instructor in advance to make arrangements.

HOMEWORK

Homework is due at the beginning of class (xx00 UTC). *Late homework is not accepted unless mitigating circumstances are present.* If this is the case, bring documentation (court papers, note on doctor's letterhead, etc.) Homework carries the weight of one major exam (100 points) in the course. Failure to do homework will severely damage to your grade.

Homework Performance Standards

- For problems involving calculations, <u>all work must be shown</u>. If a numerical answer is obtained without doing a calculation, state clearly that this is the case. For example: "By inspection, the potential is <u>25 Volts</u>."

- When showing work for numerical problems, all defining equations will be stated first. The last step in the problem will be substitution of values into the equations. For example:

  Given V = 20V and R = 5 Ohms, find the current I.

  $$I = \frac{V}{R}$$ (Comment: The defining equation, Ohm's law, is stated.)

  $$I = \frac{20V}{5\Omega} = \underline{\underline{4A}}$$ (Comment: Note that units are clearly displayed for the answer.)

- When a numerical answer is given, it must be <u>boxed</u> or <u>underlined</u> and have <u>correct units</u> attached.

- No credit will be given for any problems that have not been worked according to these instructions, or any additional instructions given by the instructor.

- The homework solutions are intended as an example of proper work. You can access them from the instructor's web site.

GRADING

There are 3 major exams, an unspecified number of quizzes given at random intervals, various homework assignments, and a final examination given in the 15th week of the course. Your grade will be determined as follows:

2 Highest Major Exams @ 100 points each:	200 points
Quizzes/Homework:	100 points
Final Exam (Comprehensive):	150 points
Laboratory	<u>100 points</u>
	550 points total for course

Lecture portion of grade, 450 points

Laboratory portion, 100 points

Important:

❖ *There is one drop test. The lowest grade from the three major exams is not counted. <u>There are no "make-up" exams given</u>. Only one examination will be dropped during the term. All students must take the final exam.*

❖ *To earn a passing grade in this course, a passing grade percentage is required in both the laboratory and lecture portions of the course. 60% is the minimum passing percentage. A minimum of 60 points is required to pass lab, and 270 points is required to pass lecture.*

DETERMINATION OF LETTER GRADE FOR THIS COURSE

90 - 100 % = A   80 - 89 % = B   70 - 79 % = C   60 - 69 % = D
     <60 % = F

Special Resources Online for ECT261

http://faculty.kc.devry.edu/twheeler

The following materials are online on the instructor's web site. Use the ECT261 shortcut.

<u>Detailed solutions to all homework problems</u>: Are you stuck on a problem away from school? Can't find help? No problem, just look up the instructor's solution! All problems are extensively commented to help you understand the "why" of each solution.

<u>Practice examinations using WebTest</u>: Ready for the next exam? This tool is intended to assist you in polishing your study methods. WebTest delivers and grades a personalized and confidential "test" for you at any time. The content of the online exams is similar to those given in the course, with a pool of over 400 random questions available.

<u>Links to Amateur Radio sites for those interested in ham radio</u>: Studying for the ham radio license? You can learn more about amateur radio by following the links provided. Most Kansas City radio clubs are represented; many offer ham classes at little or no charge.

PLAGIARISM AND OTHER FORMS OF CHEATING

Copying the work of another, and claiming it to be your own is <u>plagiarism</u>. This includes (but is not limited to) copying others homework, copying from a lab manual or textbook, or collusion. The minimum penalty for cheating in any form is a grade of zero for the element involved; in some cases, failure of the course and/or expulsion from the Institute will also result. *All cases of misconduct will be documented and forwarded to Student Services for disciplinary consideration*. The DeVry Student Handbook contains complete information on this topic.

MISCELLANEOUS INFORMATION

EMERGENCY PROCEDURES - Each classroom has a plaque (located near the door) with instructions for evacuation in the event of an emergency. The instructor will remain in charge of your class group should the situation arise.

FOOD and DRINK are not allowed in the classrooms and labs at DeVry.

HOMEWORK / READING ASSIGNMENTS

All assignments refer to the course textbook. Worked problems are available on the instructor's web site (`http://faculty.kc.devry.edu/twheeler`).

UNIT I: FREQUENCY DOMAIN, AM THEORY

1.   Chapter 1 problems 1-14
2.   Chapter 2 problems 1-23
3.   Chapter 3 problems 1-26

UNIT II: AM TRANSMISSION AND RECEPTION

4.   Chapter 4 problems 1-12
5.   Chapter 4 problems 13-29
6.   Chapter 5 problems 1-32

UNIT III: PLL, FM THEORY, FM TRANSMISSION AND RECEPTION

7.   Chapter 7 problems 1-10
8.   Chapter 8 problems 1-12,14-29
9.   Chapter 9 problems 1-17

UNIT IV: EM PROPAGATION, TRANSMISSION MEDIA, ANTENNAS

10.   Chapter 11 problems 1-12,14,20,21-31
11.   Chapter 12 problems 1-12,13-15,21-29

TERMINAL OBJECTIVES FOR ECT261

1. Given a typical baseband or broadband signal, determine the correct signal representation in the time and frequency domains using the Fourier series and Bessel functions.
2. Given a nonlinear circuit application, determine the output signal in the frequency and time domains.
3. Given a communications system, name the various external and internal sources of noise (interference) and techniques that could be used to reduce their undesirable effects.
4. Given the block diagram of a transmitter or receiver, recognize and describe the function of each of the blocks in the circuit.
5. Given the input signals (analog or digital) to a modulator (amplitude, frequency, or phase), determine the modulated output signal properties such as modulation index, bandwidth, and power in the carrier and side frequency components.
6. Given a digital modulation technique used in modems such as QPSK and QAM, represent the modulated signal in a polar plot. (Covered in ECT-215)
7. Given a demodulation circuit and the modulated signals, determine the demodulated signal in the time and frequency domains.
8. Given a communications block diagram, compare and contrast the demodulated output signal to noise ratio or bit error rate for various modulation techniques as appropriate.
9. Given a free space radio propagation situation including separation distance, carrier frequency and antenna properties, determine the path loss and or link budget given the transmitter power and receiver sensitivity.
10. Given a transmission line, source and load characteristics, determine the effects of traveling waves to calculate wavelengths, propagation delays, impedance mismatches and standing waves.
11. Given a specific electronics communication application, justify the appropriate choice of channel in terms of economics, bandwidth and noise.

Every class is to some extent a unique interactive experience, which may cause some variance within the stated objectives, in either content or level. Individual faculty, based on their experience and expertise, are encouraged to add objectives, as they deem appropriate, and to communicate these directly to the class. The outcomes of the course will depend on the design of the course, the quality of instruction, and the motivation and capabilities of the students, including time available for studying and the effectiveness of the effort.

The following table can be used to estimate your standing in this course as of midterm. *You will be required to fill out the data in this table, and bring it to our mid-term class meeting.*

There are no midterm grades delivered by the DeVry system; by filling in the data in this table, you will compute your own midterm grade. You are responsible for keeping track of the information on this worksheet.

Laboratory Portion of Midterm Grade:

In the table below, the number of points possible for each lab is given. Write in your scores (from your returned papers).

Lab 1	Lab 2	Lab 3	Lab 4	Lab 5	Lab 6	Lab 7
100	100	100	100	100	100	100

Your midterm lab grade percentage is the sum of all the lab scores entered, divided by the number of labs assigned (probably 3 or 4 depending on schedule).

A: Lab Midterm Grade Percentage: _____

Class Midterm Grade:

Your midterm grade will consist of 100 percentage points from homework, 100 percentage points from exam #1, and 50 percentage points from laboratory. Complete the data in the table below:

Assignment	HW 1	HW 2	HW 3	HW 4	HW 5	HW 6
Possible Points	14	23	26	12	13	32
Your Score						

Note: Add only the homeworks assigned; may not include HW5 or HW 6.

B: Total Possible Points (Sum of assigned homeworks): _____

C: Homework points you've earned (Sum of your homework scores): _____

D: Your midterm homework percentage = 100 * (C/B) = _____

E: Your score on exam 1: _____

Your class midterm grade $= \dfrac{\left(\dfrac{A}{2} + D + E\right)}{2.5} =$ _____